

**MARK SCHEME for the October/November 2011 question paper
for the guidance of teachers**

0652 PHYSICAL SCIENCE

0652/31

Paper 3 (Extended Theory), maximum raw mark 80

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- 1 (a) 50 m/s ; [1]
- (b) acceleration/deceleration/slowing down ;
constant/steady referring to acceleration/deceleration (**not** at constant speed)/calculated value of acceleration/comes to rest ; [2]
- (c) (i) use of gradient, $(a = (30 - 0)/(10 - 0))$;
3.0 m/s² ; [2]
- (ii) use of $F = ma = 1500 \times 3.0$ (e.c.f.) ;
= 4500 N ; [2]
- (iii) mention of frictional force/air resistance ;
force from engine = accelerating force + frictional force/work done against friction ; [2]
- (d) (car B) ;
larger gradient/same mass (**not** accept shorter period of time) ;
greater acceleration/deceleration ; [2]
(both marks can be scored for a correct calculation of both accelerations and comment)

[Total: 11]

- 2 (a) (i) $2\text{NO} + 2\text{CO} \rightarrow \text{N}_2 + 2\text{CO}_2$
all formulae correct ;
balanced ; [2]
($\text{NO} + \text{CO} \rightarrow \text{N} + \text{CO}_2$ max 1)
- (ii) nitrogen (monoxide) is reduced because it has lost oxygen ;
carbon (monoxide) is oxidised because it has gained oxygen ; [2]
(marks can be gained for correct reference to electron loss and gain/oxidation states)
(1 max if general explanation without reference to NO and CO is given)
- (iii) any two:
(percentage) of nitrogen monoxide has decreased ;
(percentage) of nitrogen has increased ;
(percentage) of carbon monoxide has decreased ;
(percentage) of carbon dioxide has increased ; [max 2]
- (iv) carbon monoxide reacts with oxygen to form carbon dioxide/hydrogen reacts with oxygen to form water ; [1]
(if the carbon monoxide to carbon dioxide process is not scored in (iii) it can score here)
- (b) (i) galvanising means coating with zinc ;
zinc more reactive than steel/iron ;
zinc reacts not iron/sacrificial reaction ; [3]

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- (ii) painted steel will rust if scratched or chipped but galvanised will not (rust) ; [1]
(both required, but allow the comment re zinc not reacting if included in (i))

[Total: 11]

- 3 (a) the band vibrates ;
causing air (molecules) to vibrate/forming a longitudinal/compression wave in the air ; [2]

- (b) 4.5 or 5 waves number of waves or specified number of divisions ;
4.5 in 4 divs (accept 5 waves in 5 divs) ;
f = 450 (Hz) ; [3]
(allow rounding errors for answer) (use of only one wave – 2 max, raw answer 400 Hz – 2 max)

[Total: 5]

- 4 (a) (i) light provides energy ; [1]

- (ii) reduction is gain of an electron/oxidation state goes down ; [1]

- (iii) $\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$; [1]

- (b) (i) add potassium bromide solution to silver nitrate solution until no further reaction ;
filter (to obtain ppt) ;
wash ppt with distilled water ;
leave ppt to dry ;
keep in dark ; [max 4]

- (ii) $\text{AgNO}_3 = 170$ and $\text{AgBr} = 188$;
number of moles = $\frac{5}{170}$ (accept $\frac{5}{188}$) ;
= 5.5 g ; [3]

[Total: 10]

- 5 (a) (i) use of $I = V/R$ (= 6/48) ;
= 0.125 A (0.13 A) ; [2]

- (ii) (e.c.f.) use of $R = V/I$ (= 4.5/0.125) ;
= 36 Ω ; [2]

- (b) $R = V/I = 3.0/0.125 = 24 \Omega$ /discussion re $\frac{1}{2}$ potential difference leads to $\frac{1}{2} R$; [1]

- (c) (i) use of $1/R = 1/R_1 + 1/R_2 = 1/24 + 1/8 = 4/24$ (accept sum/product) ;
 $R = 24/4 = 6 \Omega$; [2]
(must show $R = 6 \Omega$)

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(ii) $(6 + 24 =) 30 \Omega$; [1]

(iii) (e.c.f.) current = $6/30 = 0.2 \text{ A}$;
potential difference = $0.2 \times 6 = 1.2 \text{ V}$; [2]

(iv) dim/not properly lit if potential difference < 3, bright if
potential difference > 3, normal if potential difference = 3 ; [1]

[Total: 11]

6 (a) $\text{CaCO}_3 = 100$;
number of moles = $\frac{2.5}{100}$ or 0.025 ;
= 0.6 dm^3 ; [3]

(b) (i) calcium oxide is a base because it gains a proton/the oxide ion gains a
proton ;
hydrochloric acid is an acid because it donates a proton ; [2]
(max 1 if neither refers to specific reaction)

(ii) amphoteric ;
acidic ;
neutral ; [3]

[Total: 8]

7 (a) (i) the needle of the voltmeter moves ;
then goes back to zero ;
(do **not** allow if there is a residual current. e.g. needle falls to zero) [2]

(ii) when the magnet moves the coil cuts/there is a change in magnetic flux ;
which induces an e.m.f./current ; [2]

(b) the needle of the voltmeter moves in the opposite direction ; [1]

(c) wave trace seen on the cathode ray oscilloscope ;
changing current produces changing field ; [2]

[Total: 7]

8 (a) (i) noble gases (do not accept inert, rare) ; [1]

(ii) boiling point increases/density increases/mass increases ;
with increasing atomic number/down group ; [2]

(iii) unreactive (accept inert) ; [1]

(iv) any value between 4.5 and 9.9 kg/m^3 ; [1]

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- (b) (i) diagram showing 8 electrons in outer shell ;
3 shells with 2 electrons in first shell and 8 in second shell ; [2]
- (ii) potassium, 1+ **OR** chloride, 1- ;; [2]
- (iii) loses electrons ;
two electrons are lost ; [2]

[Total: 11]

- 9 (a) (i) liquid turns to vapour/gas (not molecules) ; [1]
- (ii) boiling: bubbles of vapour form in the liquid ;
evaporation: molecules leave the surface of the liquid ;
OR
boiling occurs at fixed temperature ;
evaporation at a range of temperatures 1 ; [max 2]
OR
boiling is a violent process (1 max) ;

- (b) 15 – 25 °C ; [1]

- (c) molecules lose energy/slow down etc. ; (not accept **molecules** lose **thermal** energy)
clear energy loss is loss in kinetic energy/energy is transferred to the surroundings/hence temperature falls ; [2]

[Total: 6]